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STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS

LOAD CONDITION STUDIES

in co-operation with

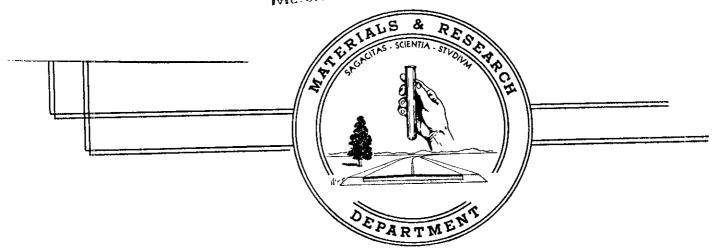
U. S. BUREAU OF PUBLIC ROADS

SECOND SUPPLEMENTAL REPORT

DATA ON
ROADWAY STRUCTURE AND ROADWAY CONDITION
AS SURVEYED
December, 1957; September-October, 1958

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State of California Department of Public Works Division of Highways

MATERIALS AND RESEARCH DEPARTMENT

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DATA ON
ROADWAY STRUCTURE AND ROADWAY CONDITION
AS SURVEYED
December, 1957; September-October, 1958

Prepared by MATERIALS AND RESEARCH DEPARTMENT

F. N. Hveem Materials and Research Engineer

> Research No. 00258 Work Order No. 13NN26

> > December, 1958

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LOAD CONDITION STUDIES

Introduction

This second supplemental report summarizes surveys made December, 1957, and September-October, 1958. It compares changes that have taken place in the selected sections of portland cement and bituminous pavements during a period of from three to three and one-half years since a survey in 1955, and a total period of from six to seven and one-half years since the original survey.

A report dated August 13, 1953, gives complete description of the pavements at the time of the original survey, including structural section and drainage details. These are not included in this report.

The report dated August 13, 1953, covers 25 pavement sections but 11 were omitted in the first supplemental report and 4 more of them are omitted from this second report. Sections have been omitted for reasons such as relocation or reconstruction of the highway, or abandonment of the nearby loadometer station.

The sections included in this report are:

Portland Cement

Load.	Sta.	No.	5 12	X-S.J-66-A III - Col-7-B	Mossdale* Williams
	11			VI-Fre-4-C	Herndon
16	t1	11	32	IV-A1a-5-F	Greenville
11	Ħ	11	61	XI-S.D-2-D	Oceanside

<u>Bituminous</u>

Load.	Sta.	No.	24	V-Mon-2-D	Soledad*
11	! 1	11	44	VII-Ven-2-C	Ventura
**	11	11	50	VI-Ker-4-D	Bakersfield
11	#1	11	50	VI-Ker-4-D	Bakersfield
11	11	71	67	VIII-Riv-26-C	Whitewater
11	51	11	75	I-Hum-1-E	Scotia

* These sections were reconstructed soon after this supplemental survey was made and will not be available for further study.

The sections included in this second supplemental report are summarized on the following pages and are arranged in the order listed above.

Each section is 1000 feet in length and the total defects shown per section are comparable, one with the other.

Three of the bituminous pavements and some of the shoulders have been patched. Patched areas are shown as a separate item and are not included in the individual totals of alligator cracking, block cracking and shoving. In some cases patching has reduced the tabulated areas of these defects below those shown in a previous survey.

Loadometer Station No. 5
Road X-S.J-66-A (Mossdale)
1000-foot test section.
PCC Pavement; 50 20-ft. slabs

				·			
	PAV	EMENT CONDI	TION				
		Nov. 1951	Мау 1955	Dec. 1957			
	NUMBER	OF CRACKED	SLABS				
Right Lane Left Lane		50 49	50 49	50 49			
	NU	MBER OF CRA	CKS				
Right Lane Left Lane		138 185	149 190	150 191			
	TOTAL FOOTAGE OF CRACKS						
Right Lane Left Lane		827 1016	880 1068	883 1070			
Me	FAU easured 18" from	LTING AT CR inner and o	ACKS uter ends o	f cracks			
Right Lane Left Lane		None None	None None	None None			
Mea	FAU sured 18" from in	LTING AT JO	INTS er edges of	pavement			
Right Lane	•						
Inner:	Average Total	0.12" 6.07"	0.17" 8.47"	0.19" 9.43"			
Outer:	Average Total	0.14" 6.96"	0.18" 9.09"	0.20" 10.22"			
<u>Left Lane</u> :				o 17ti			
Inner:	Average Total	0.11" 5.66"	0.14" 7.01"	0.17" 8.40"			
Outer:	Average Total	0 · 12" 6 · 13"	0.15" 7.53"	0.18" 8.78"			

SHOULDER CONDITION

1951: Shoulders were in good condition.

1955: Shoulders were in generally good condition with the following exceptions: On the right there is a longitudinal crack approximately 6" from the edge of pavement throughout the section. On the left approximately 6" from the edge of the pavement, there is a longitudinal crack from Sta. 241+00 to Sta. 244+00. Both shoulders have several transverse cracks, many of which are extensions of pavement cracks and joints.

1957: Shoulders were in generally good condition with the same exceptions noted in 1955. In addition, there is a substantial increase in the number and severity of transverse cracks in both shoulders.

The state highway route which includes this test section, was in the process of relocation and reconstruction when the 1957 survey was made. It will not be available for future consideration.

Loadometer Station No. 12 Road III-Col-7-B (Williams) 1000-foot test section PCC pavement; 50 20-ft. slabs

	PAVEMENT CONDITION				
			Oct. 1952	May 1955	Dec. 1958
	N	UMBER OF C	RACKED SLAB	S	
Right Lane Left Lane			33 16	- 45 28	49 42
		NUMBER (OF CRACKS		
Right Lane Left Lane			40 16	55 28	62 45
	T	OTAL FOOTAG	GE OF CRACK	S	
Right Lane Left Lane			353 * 165 *	523 * 281*	593 4 3 0
	*Corrected	figures for	r 1952 and	1955 reports	
M	easured 18"	FAULTING from inner	AT CRACKS and outer	ends of cracks	
Right Lane					
Inner:	Average Total		0.03" 1.00"	0.03" 1.46"	0.03" 1.88"
Outer:	Average Total		0.02" 0.88"	0.03" 1.77"	0.03" 1.67"
<u>Left Lane</u>					
Inner:	Average Total		0.03" 0.50"	0.03" 0.98"	0.03" 1.26"
Outer:	Average Total		0.04" 0.61"	0.03" 0.88"	0.03" 1.40"
M	easured 18"	FAULTING from inner	AT JOINTS	edges of lanes	ŧ

Right Lane

Inner:	Average	0.18"	0.24"	0.25"
	Total	8.81"	11.96"	12.73"

FAULTING AT JOINTS (Continued)

		Oct. 1952	May 1955	Dec. 1958
Right Lane	(Continued)			
Outer:	Average	0.17"	0.23"	0.27"
	Total	8.62"	11.72"	13.21"
<u>Left Lane</u>				
Inner:	Average	0.15"	0.22"	0.25"
	Total	7.33"	11.11"	12.35"
Outer:	Average	0.15"	0.23"	0.27"
	Total	7.40"	11.60"	13.63"

SHOULDER CONDITION

- 1951: The shoulders were in generally fair condition throughout the section.
- The shoulders are practically a total failure with the exception of the right shoulder from Sta. 488+70 to Sta. 490+00, and the left shoulder from Sta. 284+10 to Sta. 483+40 and from Sta. 485+00 to Sta. 486+50.
- 1958: Shoulders throughout the test section area were road mixed during the summer of 1958 and additional asphalt was added. At time of resurvey, both shoulders appeared to have had a heavy fog seal after recompaction. Shoulders are in generally excellent condition. A few cracks are developing adjacent to some of the most active PCC slabs.

Loadometer Station No. 26 Road VI-Fre-4-C, (Herndon) 1000-foot test section. PCC Pavement: 50 20-foot slabs

PAVEMENT CONDITION

	April 1952	March 1955	Oct. 1958			
	NUMBER OF CRACKED SLA	BS				
Right Lane	25*	28	31			
	NUMBER OF CRACKS					
Right Lane	35	44	53			
	TOTAL FOOTAGE OF CRACKS					
Right Lane	297*	343*	379			
*Corrected	l figures for 1952 and	1955 reports				
Measured 18	FAULTING AT CRACKS	ends of crack	s			

Measured 18" from inner and outer ends of cracks

Right Lane

Inner:	Average	0.05"	0.08"	0.07"
	Total	1.78"	3.35"	2.30"
Outer:	Average	0.05"	0.07"	0.05"
	Total	1.77"	3.20"	2.68"

FAULTING AT JOINTS

Measured 18" from inner and outer edges of lane

Right Lane

Inner:	Average	0.07"	0.10"	0.06"
	Total	3.48"	5.15"	2.84"
Outer:	Average	0.06"	0.10"	0.06"
	Total	3.26"	5.34"	3.25"

SHOULDER CONDITION

The shoulder was in generally good condition throughout the section.

SHOULDER CONDITION (continued)

- 1955: The shoulder was in generally good condition with the exception of an area approximately one foot wide adjacent to the edge of pavement. This area of short transverse cracks, is bounded by the edge of pavement and longitudinal cracks. The area extends the length of the section except from Sta. 353+90 to Sta. 354+30.
- 1958: Shoulder has been patched adjacent to outer edge of PCC pavement and has received a fine sand seal coat. Patch and seal coat are 2.0' + wide and extend the entire length of the section. There are several areas which appear to be shoving. Shoulder is generally in good condition.

Loadometer Station No. 32 Road IV-Ala-5-F (Greenville) 1000-foot test section PCC Pavement: 67 15-foot slabs

PAVEMENT	CONDITION
LWARMINIAT	COMPTITON

	PAVEMENT CO	ONDITION			
		July 1952	May 1955	Oct. 1958	
	NUMBER OF CRAC	KED SLABS			
Right Oute: Right Inne		3 None	11 None	16 1	
	NUMBER OF	CRACKS			
Right Oute:		3 None	11 None	17 1	
	TOTAL FOOTAGE	OF CRACKS			
Right Oute: Right Inne		21 None	91 None	155 5	
M	FAULTING AT easured 18" from inner an		s of cracks		
Right Oute	r Lane				
Inner:	Average Total	None None	0.06" 0.70"	0.02" 0.26"	
Outer:	Average Total	0.01" 0.03"	0.01" 0.10"	0.03" 0.46"	
Right Inne	r Lane				
Inner Outer		None None	None None	None None	
FAULTING AT JOINTS Measured 18" from inner and outer edges of lanes					
Right Oute	r Lane				
Inner:	Average Total	0.04" 2.68"	0.06" 3.84"	0.05" 3.53"	
Outer:	Average Total	0.05" 3.12"	0.07" 4.87"	0.09" 6.26"	

		July 1952	May 1955	Oct. 1958
		FAULTING AT JOINTS (Continued)		
Right Inne	r Lane			
Inner:	Average Total	0.02" 1.77"	0.03" 2.31"	0.04" 2.52"
Outer:	Average Total	0.02" 1.53"	0.05" 3.04"	0.04" 2.78"

SHOULDER CONDITION

- 1952: Shoulders were in generally good condition except for a 3/4-inch opening between the shoulder and the pavement.
- 1955: Shoulders were in generally good condition. The 3/4-inch opening between shoulder and pavement has been sealed.
- 1958: Shoulders have pulled away from edges of PCC pavement. In many areas, shoulders have also settled from 1/2-inch to 1 inch lower than PCC. There are a few new cracks in shoulders.

Loadometer Station No. 61 Road XI-S.D-2-D (Oceanside) 1000-foot test section PCC Pavement: 67 15-foot slabs

PAVEMENT CONDITION

Feb. Oct. 1958

NUMBER OF CRACKED SLABS

Right Outer Lane None None

NUMBER OF CRACKS

Right Outer Lane None None

TOTAL FOOTAGE OF CRACKS

Right Outer Lane None None

FAULTING AT CRACKS

Right Outer Lane None None

FAULTING AT JOINTS

Measured 18" from inner and outer edges of lane

Right Outer Lane

Inner: Average Total 0.004" 0.01" 0.87"

Outer: Average Total 0.004" 0.02" 0.02" 1.48"

SHOULDER CONDITION

1955: The asphaltic mix shoulder on the right is in generally good condition.

1958: The asphaltic mix is in fair condition. A road mix blanket averaging 3.0' in width has been placed adjacent to the outer edge of PCC pavement. The resulting joint between pavement and shoulder is open and has not

SHOULDER CONDITION

1958: (continued)

been sealed.

There are pumping stains on the shoulder near many of the contraction joints in the PCC pavement and in many cases, there are depressed areas in the shoulder at these stains. There is one area of block cracking in the shoulder blanket. This area is approximately 2.0' wide and extends from Station 295+80 to Station 296+25 (90 square feet).

Loadometer Station No. 24 Road V-Mon-2-D (Soledad) 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

PMS blanket has received a seal coat since the survey

made in 1952.	The section was not surveyed in	1955.	
		Oct. 1952	Oct. 1958
	FOOTAGE OF SINGLE CRACKS		
Right Lane Left Lane		54 None	108 27
	AREA OF ALLIGATOR CRACKING		
Right Lane Left Lane		None None	1222 sq.ft. 2715 ""
	AREA OF BLOCK CRACKING		
Right Lane Left Lane		None None	2968 sq.ft. 927 sq.ft.
	AREA OF SHOVING		
Right Lane Left Lane		None 164 sq.ft.	None None
	AREA OF PATCHES		
Right Lane		None None	16 sq.ft. 1170

Right Lane	None	16 sq.ft.
Left Lane	None	1170 ""
Terr Danc		

TOTAL AREA OF FAILURE*

Right Lane	None	4206	sq.ft.
Left Lane	164 sq.ft.	4812	sq.ft.

^{*}Sum of areas of shoving, alligator cracking, block cracking and patches.

684 sq.ft. 1359 sq.ft. None None

SHOULDER CONDITION

FOOTAGE OF SINGLE CRACKS

	10011102 01 0111022 0		
		0ct. 1952	Oct. 1958
Right Lane Left Lane		450 1414	560 1414
	AREA OF ALLIGATOR CR	ACKING	
Right Lane Left Lane		None None	None None
	AREA OF BLOCK CRAC	CKING	
Right Lane Left Lane		None None	575 sq.ft. None
	AREA OF SHOVING	}	
Right Lane Left Lane		684 sq.ft. None	684 sq.ft. None
	AREA OF PATCHES	3	
Right Lane Left Lane		None None	100 sq.ft. None
	TOTAL AREA OF FAI	LURE	

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Right Lane Left Lane

Loadometer Station No. 44 Road VII-Ven-2-C (Ventura) 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

Entire test section was covered with a plant-mixed surfacing blanket in early summer, 1958. No cracks or failure areas are in evidence. Blanket extended beyond original traveled way pavement onto shoulders. Cracking noted in 1955 survey could not be retraced.

AREA OF ALLIGATOR CRACKING (SHOULDERS)

	Feb. 1951	Feb. 1955	Oct. 1958
Right Lane	None	None	None
Left Lane	None	None	1000 sq.ft.

Loadometer Station No. 50 Road VI-Ker-4-D (Bakersfield) Sta. 290+00 to 300+00 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

Note: Both lanes of the traveled way have had a "slurry" seal coat applied since 1955 survey was made.

	May 1952	March 1955	Oct. 1958	
	FOOTAGE OF SI	INGLE CRACKS		
Left Outer Lane Left Inner Lane	91 252	312 437	606 656	
	AREA OF ALLIC	GATOR CRACKING		
Left Outer Lane Left Inner Lane	None None	None None	131 sq. ft. 147 sq.ft.	
	AREA OF BLO	OCK CRACKING		
Left Outer Lane Left Inner Lane	None None	None None	542 sq. ft. 30 sq. ft.	
	AREA OF	SHOVING		
Left Outer Lane Left Inner Lane	None None	None None	None None	
	AREA OF	PATCHES		
Left Outer Lane Left Inner Lane	None None	None None	None None	
TOTAL AREA OF FAILURE*				
Left Outer Lane Left Inner Lane	None None	None None	673 sq.ft. 177 sq.ft.	
de - E amos of a	lligator crack	ing and block	cracking.	

SHOULDER CONDITION

Note: Both shoulders have been patched adjacent to the edge of traveled way since the 1955 survey was made.

Areas shown as single cracks or block cracking in previous surveys are included in patched areas.

P-01-0			
	May	March	Oct.
	1952	1955	1958
	FOOTAGE OF SINGLE CRA	CKS	
Outer Shoulder	4	23	None
Inner Shoulder	21	100	437
	AREA OF ALLIGATOR CRAC	KING	
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
	AREA OF BLOCK CRACKI	NG	
Outer Shoulder	None	90 sq.ft.	None
Inner Shoulder	None	465 sq.ft.	None
	AREA OF SHOVING		
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
	AREA OF PATCHES		
Outer Shoulder	None	65 sq.ft.	1525 sq.ft.
Inner Shoulder	None	350 sq.ft.	1550 sq.ft.
	TOTAL AREA OF FAILU	JRE	
Outer Shoulder	None	155 sq.ft.	1525 sq.ft.
Inner Shoulder	None	815 sq.ft.	1550 sq.ft.

Loadometer Station No. 50 VI-Ker-4-D Sta. 330+00 to 340+00 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

PAVEMENT CONDITION				
	May 1952	March 1955		
	FOOTAGE OF SINGL	E CRACKS		
Left Outer Lane Left Inner Lane	847 683	1197 1134	1487 1475	
	AREA OF ALLIGATOR	CRACKING		
Left Outer Lane Left Inner Lane	20 None	sq.ft. 45 None	sq.ft. 85 None	sq.ft.
	AREA OF BLOCK C	RACKING		
Left Outer Lane Left Inner Lane	201 None	sq.ft. 124 None		sq.ft. sq.ft.
	AREA OF SHOW	'ING		
Left Outer Lane Left Inner Lane	None None	None None	None None	,
	AREA OF PATO	CHES		
Left Outer Lane Left Inner Lane	None None	205 None	sq.ft. 1225 473	sq.ft. sq.ft.
TOTAL AREA OF FAILURE*				
Left Outer Lane Left Inner Lane	None	sq.ft. 374 None	523	sq.ft. sq.ft.
*Sum of areas of	alligator cracking,	block cracki	ng and patche	s.

SHOULDER CONDITION

FOOTAGE OF SINGLE CRACKS

Outer Shoulder	15	160	373
Inner Shoulder	8	116	300

SHOULDER CONDITION (Continued)

	Мау	March	Oct.
	1952	1955	1958
	AREA OF ALLIGATOR CRACK	ING	
Outer Shoulder	20 sq.ft.	60 sq.ft.	270 sq.ft.
Inner Shoulder	None	None	None
	AREA OF BLOCK CRACKIN	G	
Outer Shoulder	140 sq.ft.	None	None
Inner Shoulder	None	None	None
	AREA OF SHOVING		
Outer Shoulder	None	None	None
Inner Shoulder	None	None	None
	AREA OF PATCHES		
Outer Shoulder	None	195 sq.ft.	510 sq.ft
Inner Shoulder	None	None	375 sq.ft
	TOTAL AREA OF FAILUR	Œ*	
Outer Shoulder	160 sq.ft.	255 sq.ft.	780 sq.ft.
Inner Shoulder	None	None	375 sq.ft.

^{*}Sum of areas of alligator cracking, block cracking and patches.

Loadometer Station No. 67 Road VIII-Riv-26-C (Whitewater) 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

Both lanes of the traveled way in this section have received a heavy asphalt and chip seal coat since the time of the last survey. Seal coat is approximately 23.5 feet wide and effectively covers almost all of the previously charted cracks.

SHOULDER CONDITION

AREA OF SHOVING

	May	Feb.	Oct.
	1951	1955	1958
Outer Shoulder	None	None	10 sq.ft.

Throughout most of the test section, the outer shoulder has subsided along the longitudinal crack which was first charted in 1951. There is one exception to this condition; between Station 291+12 and Station 292+14.

Loadometer Station No. 75 Road I-Hum-1-E Scotia 1000-foot test section Bituminous pavement

PAVEMENT CONDITION

	PAVEMENT CONDITION		
	Aug. 1951	May 1955	Sept. 1958
	FOOTAGE OF SINGLE CRA	CKS	
Right Lane Left Lane	181 5	245 5	445 75
	AREA OF ALLIGATOR CRAC	KING	
Right Lane Left Lane	None None	None None	None None
	AREA OF BLOCK CRACKI	NG	
Right Lane Left Lane	None None	None None	None None
	AREA OF SHOVING		
Right Lane Left Lane	None None	None None	None None
	AREA OF PATCHES		
Right Lane Left Lane	None None	None None	None None
	SHOULDER CONDITION	1	
	FOOTAGE OF SINGLE CRA	ACKS	
Right Shoulder Left Shoulder	182 192	343 482	351 497

There are no other signs of shoulder failure.